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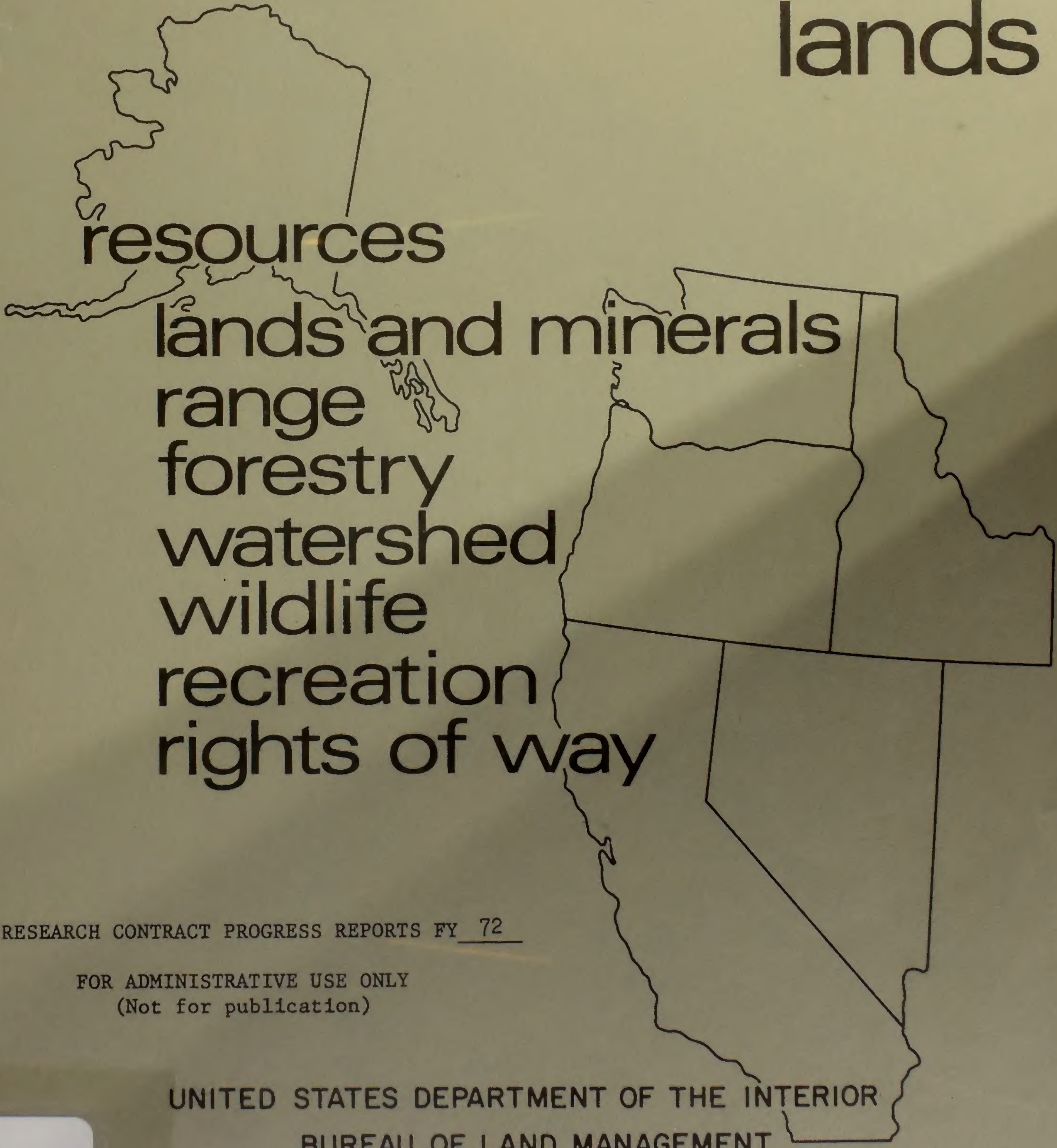

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RESEARCH CONTRACT PROGRESS REPORTS FY 72

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INTRODUCTION

These Annual Progress Reports present a resume of contractural accomplishments of the Portland Service Center for the reporting period July 1, 1971 to June 30, 1972.

The material presented was extracted from more detailed information which each COAR has available to them. Inquiries about specific projects should be directed to the State Office Representative or the COAR of each project.

These Progress Reports have been prepared primarily for administrative use, and many of the results are inconclusive; therefore, the information is not to be used for publication unless prior authorization from the Portland Service Center is obtained.

BLM RESEARCH PROGRESS REPORT
FY 1972

I. Project Title: White Spruce Silviculture Study

Contract Number: 53500-CT1-228

II. Contractor: U.S. Forest Service, Institute of Northern Forestry

No Progress Report has been submitted for this research contract.

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BLM RESEARCH PROGRESS REPORT
FY 1972

I. Project Title: Caribou-Poker Creek Project

Contract Number: 53500-CT1-355(N)

II. Contractor: University of Alaska

III. Project Location: Alaska, Fairbanks District

IV. Personnel:	BLM:	1. Service Center	Robert Martin
		2. State Office	Sal DeLeonardis
	Contractor:	1. Project Leader	Dr. Bonita J. Neiland

V. Starting Date: June 1, 1971
Expected Completion Date: July 1, 1973

VI. Objective: To determine vegetation-topographic combinations that will indicate substrate conditions and their susceptibility to erosion and to permafrost degradation, their compactibility and recovery potential.

VII. Progress:

Literature Search: Possible knowledgeable agencies were contacted for unpublished literature. This and other available literature convinced the investigator that information on vegetation-substrate correlation has not been obtained, at least at the scale desired. Very gross conclusions were made, mostly from observations. Many of them turned out to be based on opinion rather than field examination.

Transects: Due to exasperatingly difficult logistic problems, transect data were obtained only on the north-facing slope, while only preliminary reconnaissance was made on the south-facing slope. The north-facing slope, however, was fairly well covered. One transect of 1,300 feet in length was run on the 1,100-feet contour and one of 2,700-feet was run on the 1,600-feet contour. Preliminary observations were made at various points on the 2,100-feet contour. Vegetational patterns were recorded the full distance of the two longer transects. Values taken included a count of tree stems in a 2-meter belt on either side of the line (with an estimate of most common basal area and height), recording of conspicuous breaks in the shrub, herb and floor vegetation, and notation of placement of any conspicuous

species or species groups. All of the site and substrate examinations described above were made on the 1,600-feet contour transect, most were made on the 1,100-feet transect, and depth to frozen ground and general surface descriptions only were made at intervals on the 2,100-feet transect. Soil samples were collected along the two longer transects for textural, organic content, and moisture retention determinations.

At present, the laboratory soil analyses are being completed and the vegetation and substrate records are being entered on profile diagrams of the transects. Inspection for possible correlations is being made as we go along, but the main search for possible correlations will be done once the records are complete. These findings will also be compared with pertinent results of another study being done by the principal investigator, with McIntire-Stennis fund support, of vegetation and depth to ground ice on north-facing slopes in several sites in the Fairbanks vicinity, and with those of a doctoral thesis research project being done in the watershed by William Quirk.

Even given the preliminary stage of the analyses, it is evident that some interesting information has been gained, although the indicator value of vegetation that had been hoped for is far from certain. Some of the vegetational breaks do seem to give information about substrate conditions, while others do not. Some of the latter are indicative of microtopographic differences and/or fire history, but some are so far inexplicable. Two rather unexpected findings are that fractured large rock is closer to the surface under some of the Sphagnum dominated areas than under grass or birch sites, and ground ice was not very shallow at time of maximum thaw under any of the types. There is no question but that, once the analyses are done, we will have gained much previously unavailable information on vegetation and substrate conditions, and will have fairly definite conclusions about the indicator value of this level of vegetational pattern on a long and fairly "typical" north-facing slope.

VIII. Plans for Next Fiscal Year: Contrive study in a more accessible area.

IX. Reports and Publications to Date: None from this study.

BLM RESEARCH PROGRESS REPORT
FY 1972

I. Project Title: Financial Guides to Douglas-fir Reforestation Alternatives

Contract Number: 14-11-0001-3872

II. Contractor: University of California

III. Project Location: Western Oregon

IV. Personnel:

BLM:	1.	Service Center	Karl Bergsvik
	2.	State Office	Ron Kaufman
Contractor:	1.	Project Leader	Dennis Teeguarden

V. Starting Date: July 1, 1965
Expected Completion Date: June 30, 1974

VI. Objective:

1. To develop financial guides to Douglas-fir reforestation alternatives.
2. To set forth procedures for determining the guides.
3. To rank specific tracts in order of their promise as planting sites.
4. To list and discuss various items related to the general subject matter of the study.

VII. Progress: The reports "An Economic Model for Selecting Douglas-fir Reforestation Projects", by J. Buongiorno and D. Teeguarden and "Computer Program Listings for R.P.M.", by J. Buongiorno were completed.

VIII. Plans for Next Fiscal Year:

1. Publication of a user's manual for the Reforestation Planning Model.
2. A problem analysis in planning the potential FY 74 study.

IX. Reports and Publications to Date:

1. Teeguarden, D., J. Beck, Jr., and J. Buongiorno. A Computer Program for Evaluating Reforestation Investments. May 1969.

2. Teeguarden, D., and H. L. VonSperber. Scheduling Douglas-fir Reforestation Investments, A Comparison of Methods. Forest Science. December 1969.

3. Teeguarden, D. Economic Criteria and Calculated Risk in Reforestation Investment Decisions. Journal of Forestry. January 1969.

4. Teeguarden, D. Economic Guides for Douglas-fir Reforestation in Southwestern Oregon. U.S. Dept. of the Interior, BLM Tech. Bulletin 2. January 1969.

5. Two reports under Item IV.

BLM RESEARCH PROGRESS REPORT
FY 1972

I. Project Title: Protecting Conifer Seeds from Rodents

Contract Number: 53500-CT1-45(N)

II. Contractor: University of California

III. Project Location: Laboratory at Univ. of California, Davis; and field locations on private land in California and BLM land in the Eugene District.

IV. Personnel: BLM: 1. Service Center William Smith
2. State Office Charles Thomas
Contractor: 1. Project Leader Rex Marsh

V. Starting Date: FY 1970
Expected Completion Date: June 1973

VI. Objective: To find a substitute for endrin as a tree seed protectant against deer mice and other rodents.

VII. Progress: The University has a chemical that gave favorable results in laboratory tests. It was subsequently tested in the field (see III) during the winter and spring of 1971 and 1972. Final results of these field tests in California plots indicated very favorable results. Eugene plots were inconclusive, however, and plans are being made to repeat the test, with appropriate modifications, this winter and spring. Work is on schedule towards development of information required for registration by EPA.

VIII. Plans for Next Fiscal Year: Study to terminate this fiscal year.

IX. Reports and Publications to Date: None

BLM RESEARCH PROGRESS REPORT
FY 1972

I. Project Title: Rehabilitation of Range Land Damaged by Off-Road Vehicle Use, Panoche Hills, California

Contract Number: 53500-CT1-284(N)

II. Contractor: Pacific Southwest Forest and Range Experiment Station

III. Project Location: Panoche Hills, Folsom District, California

IV. Personnel:

BLM:	1.	Service Center	Carl Rice
	2.	State Office	Stu Porter
	3.	District Office	George Burma
Contractor:	1.	Project Leader	Charlie Graham

V. Starting Date: FY 1971
Expected Completion Date: FY 1978

VI. Objective: Monitor changes imposed by management practices and uses. Determine impacts on soil, water, vegetation, air, wildlife, recreation and landscape values. Find ways to overcome past damage and prevent losses in environmental quality. Record sociological and biological inter-relationships of coordinated, complimentary and noncomplimentary uses.

VII. Progress: Rainfall from September 1971 to April 1972 equalled 2.21 inches. Fifty percent (1.2) fell in December 1971. Of the total plant community, in Panoche, only bladderpod and Mormon tea produced seed. Red brome, filaree, pine bluegrass and many other annuals produced some vegetation but no viable seed.

The effects of fertilization on January 21, 1966, is still evident within the treated area. Herbage production on the check in 1966 was 590 lbs., in 1967 was 1,078 lbs., 1971 was 368 lbs. On the fertilized plots the maximum production was 1,926 lbs. in 1966, 3,780 lbs. in 1967 and 1,596 lbs. in 1971. Rainfall varied from 7.42 inches in 1966, 8.13 inches in 1967 and 7.83 inches in 1971. The field trials that were put in in 1970 were judged a success for trigo wheatgrass, saltbush, Mormon tea and bladderpod.

California quail stomach contents were analyzed by the California Department of Fish and Game and during the dry season over 40% of their diet was Ephedra seed.

Conclusions: Under conditions of low rainfall and little or no grazing, nitrogen fertilizer may be used for relatively long-term site improvement. Two to four-fold increase in herbage production may be expected for increased soil surface protection from erosive factors.

No accelerated erosion was observed on slopes where there is adequate vegetative ground cover. Erosion is universal on bare soil. On moderate slopes, the danger of erosion may be 50 to 100 times greater on bare, compacted slopes than on slopes with a good vegetative cover. The danger of erosion on bare, compacted, moderate slopes may be 10 to 15 times higher than on bare, noncompacted areas of an equal degree of slope.

VIII. Plans for Next Fiscal Year: Continued measurements will be taken for the next four years for comparison purposes.

IX. Reports and Publications to Date: Two annual reports and no publications have been issued to date.

BLM RESEARCH PROGRESS REPORT
FY 1972

I. Project Title: Hydrologic Effects of Off-road Vehicular Use On Public Lands in California

Contract Number: 53500-CT0-369(N)

II. Contractor: Geological Survey, Rocky Mountain Region, Denver, Colorado

III. Project Location: Panoche Hills and Dove Springs, California
Folsom (Panoche Hills) and Bakersfield (Dove Springs)

IV. Personnel:

BLM:	1.	Service Center	Glenn Lipscomb
	2.	State Office	Stu Porter
Contractor:	1.	Project Leader	Richard Hadley

V. Starting Date: July 1, 1970
Expected Completion Date: June 30, 1975

VI. Objective: To quantify the effects of off-road vehicle use on the soil and vegetation resources, water quality and water quantity.

VII. Progress: All precipitation and water-stage stations, erosion transects, soil moisture sampling sites and vegetation transects have been established for both the Panoche Hills and Dove Springs study areas. Data was collected for hydrology, soils and vegetation during the past year at both Panoche Hills and Dove Springs.

Additional data will be needed before interpretations can be made of the influence of ORV use on hydrology, soils and vegetation.

VIII. Plans for Next Fiscal Year: During FY 1973 data collection will be continued at both sites. Precipitation, runoff, sediment, sheet and rill erosion, soil moisture, soil structure, and vegetation cover changes are the types of data collected. Analyses of data will not begin until subsequent years of the study (probably FY 1975).

IX. Reports and Publications to Date: Only annual progress reports.

BLM RESEARCH PROGRESS REPORT
FY 1972

I. Project Title: Evaluation of Water Yield East Putah Creek Watershed Under Multiple Use Management

Contract Number: 53500-CT0-42(N)

II. Contractor: University of California (Davis) with funds received from the Bureau of Reclamation

III. Project Location: Ukiah, California

IV. Personnel:

BLM:	1. Service Center	Carl Rice Robert Borovicka
	2. State Office	Stu Porter
Contractor:	1. Project Leader	R. H. Burgy

V. Starting Date: August 15, 1969
Expected Completion Date: August 1979 (dependent upon BR funds)

VI. Objective: Gather basic resource data, cause and effect of various management decisions.

VII. Progress: Base data collected on sediments, hydrologic relationship, chemical analysis, plant species adaptation and amendments, nutrient deficiencies, biological and aquatic species.

VIII. Plans for Next Fiscal Year: Continue base data collection and analysis of data as collection proceeds.

IX. Reports and Publications to Date:

1. Evaluation of Water Yield East Putah Creek Watershed Under Multiple Use Management, Robert H. Burgy, January 1972.

2. Berryessa Watershed Conversion Study Plots, Jerry Branvold, Ukiah District.

BLM RESEARCH PROGRESS REPORT
FY 1972

I. Project Title: Saylor Creek Experimental Range

Contract Number: Memorandum of Understanding

II. Contractor: Intermountain Forest and Range Experiment Station

III. Project Location: Boise, Idaho

IV. Personnel: BLM: 1. Service Center Rex Morgan
2. State Office John Killough
Contractor ??

V. Starting Date: 1960
Expected Completion Date: June 30, 1973

VI. Objective:

1. To determine the forage value and grazing capacities of cheatgrass ranges compared to perennial grass ranges.

2. To determine feasibility, desirability and requirements for converting from cheatgrass range to perennial grass range.

3. How best to utilize cheatgrass.

4. How to avoid encroachment and dominance of cheatgrass if this species is deemed undesirable.

VII. Progress: Cheatgrass research at Saylor Creek Experimental Range has been aimed at developing suitable management systems. Information has been obtained on a wide variety of subjects but mostly on animal performance. Vegetation response studies which may indicate the feasibility and requirements for converting from cheatgrass to perennial grass range have not been completed. However, data collected thus far strongly point in favor of a management scheme utilizing introduced species rather than native species. Forage value and grazing capacities and methods of utilization have been largely determined. Results indicate that cheatgrass should be retained on portions of the range in conjunction with crested wheatgrass (or other suitable introduced species).

VIII. Plans for Next Fiscal Year: To test techniques for broadcast seeding of perennial grasses on cheatgrass ranges.

IX. Reports and Publications to Date:

1. Klemmedson, James O., and Robert B. Murray. Use and Measurement of Site Factors and Soil Properties in Evaluation of Range Site Potential. USDA Misc. Pub. 940 (Range Research Methods). 1962. p. 68-77.

2. Klemmedson, James O. Topofunction of Soils and Vegetation in a Range Landscape. In: Forage and Plant Physiology and Soil-Range Relationships. Amer. Soc. Agron. Spec. Pub. 5, 1964. p. 176-189.

3. Klemmedson, James O., and Justin G. Smith. Cheatgrass (Bromus tectorum L.). Bot. Rev. Apr.-June):226-262. 1964.

4. Klemmedson, James O., and Robert B. Murray. Research on Management of Cheatgrass Ranges. Proc. Cheatgrass Symposium, Vale, Oregon. July 27-30, BLM. p. 38-50. 1965.

5. Murray, Robert B., and James O. Klemmedson. Response of Cheatgrass and Associated Plants to Seasonal Grazing. Proc. Range Weed Research Meeting and Field Tour. Elko, Nevada. Sept. 14-16, BLM. p. 6-8. 1965.

6. Murray, Robert B. Grazing Experiments with Cattle and Sheep on Cheatgrass Range in Southern Idaho. Range and Pasture Field Day. Knoll Creek Field Laboratory. Max C. Fleischmann College of Agriculture, Univ. of Nev. June 7, 1967. p. 5-6.

7. Murray, Robert B., and James O. Klemmedson. Cheatgrass Range in Southern Idaho: Seasonal Cattle Gains and Grazing Capacities. J. Range Management. 21:308-313. 1968.

8. Murray, Robert B. Cattle Production on Cheatgrass Range. Western Livestock Jour. (Oct. Issue). 1968.

9. Murray, Robert B. Grazing Capacity, Sheep Gains: Cheatgrass, Bunchgrass Ranges in Southern Idaho. J. Range Management 24:407-410. 1971.

10. Olsen, T. E., R. C. Bull, and S. D. Farlin. Supplementation of Cattle on Cheatgrass Range. Abstract J. Animal Sci. 33: 310. 1971.

11. Wright, Henry Albert. Influence of Fire on Important Bunchgrasses of the Sagebrush-grass Region of Southern Idaho. MS Thesis, Utah State Univ. 1962.

12. Wright, Henry Albert. An Evaluation of Several Factors to Determine why *Sitanion hystrix* is More Resistant to Burning than *Stipa comata*. PhD Thesis, Utah State Univ. 1964.

13. Wright, Henry A., and James O. Klemmedson. Effects of Fire on Bunchgrasses of the Sagebrush-grass Region in Southern Idaho. Ecology 46: 680-687. 1965.

14. Wright, Henry A. Contrasting Responses of Squirreltail and Needle and Thread to Herbage Removal. J. Range Management 21: 398-400. 1967.

15. Wright, Henry A. Response of Big Sagebrush and Threetip Sagebrush to Season of Clipping. J. Range Management 23: 20-22. 1970.

16. Wright, Henry A. A Method to Determine Heat-caused Mortality in Bunchgrass. Ecology 51: 582-587. 1970.

17. Wright, Henry A. Predicting Yields of Two Bunchgrass Species. Crop Sci. 10: 232-235. 1970.

CURRENTLY BEING WRITTEN:

18. Harniss, Roy O., and Robert B. Murray. Thirty Years of Ecological Change After Burning in a Sagebrush-grass Community. J. Range Management.

19. Murray, Robert B. Yearling Cattle Response to Grazing Intensity on Cheatgrass Range. J. Range Management.

20. Murray, Robert B. Effects of Nitrogen Fertilization on Yields and Protein Content of Cheatgrass and Needle and Thread Grass Range. J. Range Management.

BLM RESEARCH PROGRESS REPORT
FY 1972

I. Project Title: Reynolds Creek Experimental Watershed Study

Contract Number: 14-11-0001-4162(N)

II. Contractor: Agricultural Research Service (ARS), Northwest Watershed Research Center

III. Project Location: Reynolds Creek Watershed, Boise, Idaho

IV. Personnel:

BLM:	1.	Service Center	Glenn Lipscomb
	2.	State Office	None
Contractor:	1.	Project Leader	W. Russell Hamon

V. Starting Date: July 1, 1968
Expected Completion Date: June 30, 1978

VI. Objective:

1. To determine precipitation, runoff and sedimentation characteristics for various vegetation-soil units.

2. To quantify the effects of certain management and land treatment practices applied to various vegetation-soil units.

VII. Progress: The collection of cover, herbage production and soils data was initiated on most of the cooperative study sites during the summer of CY 1971. Runoff and sediment data collection was continued on all sites instrumented prior to FY 1972. Data collection from all other study sites is expected to be initiated during the coming fiscal year (1973).

Preliminary cover-herbage-soils data from a north slope big sagebrush site indicates that two treatments (2,4-D sprayed and mechanical brush removed) produced greater herbage production than an untreated area while using less total soil moisture. This first year's data showed that the treated areas produced about 40% more herbage (shrubs, grasses, forbs) than the untreated check while using about 2 inches less moisture. All three areas were located in an exclosure and were ungrazed by livestock.

Infiltration data collection was initiated during late summer of CY 1971 but the number of runs performed were too few for any analysis.

Evapotranspiration (ET) data collection will not begin until next fiscal year.

VIII. Plans for Next Fiscal Year: During FY 1973 all instrumentation will be completed and collection of data will be operational at all study sites. Data will be collected for vegetation, soils, sediment, infiltration and evapotranspiration. Analysis of data will be initiated following the collection of data during the summer of CY 1972.

The FY 1973 work plan is proposed to cover data collection and analysis for the Rabbit Creek Study currently funded directly by the Boise District Office. Rabbit Creek is located adjacent to and east of Reynolds Creek. Data being collected there will provide additional input to the objectives established for the Reynolds Creek Project. Estimated cost is $3,000.00.

When the Agreement renewal for FY 1974 is considered next year, we anticipate extension of the study for another 5-year period. The original agreement (dated 7/1/68) established a maximum 5-year period as required under ARS policy. Since our original recommendations required a minimum study period of 10 years, we tentatively expect to extend the study period through FY 1978 (estimated at the current annual level of funding of $60,000 per year).

IX. Reports and Publications to Date: Annual progress for the project is included in the Northwest Watershed Research Center's annual report for Reynolds Creek. Copies of these reports have been furnished BLM for 1969, 1970 and 1971. No publications dealing specifically with the project objectives have been published to date. However, several publications covering development of models and methodology to be used in reaching project objectives have been published.

BLM RESEARCH PROGRESS REPORT
FY 1972

I. Project Title: Infiltration Studies on Selected Vegetation-Soil Units Within Twelve Range Watersheds in Nevada

Contract Number: 14-11-0001-4632

II. Contractor: Nevada Agricultural Experiment Station, University of Nevada

III. Project Location: Nevada range watersheds

IV. Personnel:

BLM:	1. Service Center	Glenn Lipscomb
	2. State Office	John Trimmer
Contractor:	1. Project Leader	Wilbert Blackburn

V. Starting Date: July 1, 1969
Expected Completion Date: June 30, 1973

VI. Objective:

1. To establish infiltration, surface run-off, and sediment production relationships for selected vegetation-soil units in different range and hydrologic condition classes.

2. To establish what cover (vegetation, litter, pavement and rock) and soil parameters influence infiltration, surface run-off and sediment production on selected vegetation-soil units.

3. To develop parameters for use in identifying hydrologic soil groups and subgroups.

VII. Progress: The collection of field data (infiltration, sediment, soils, cover, etc.) has been completed for the project. Data was collected from 28 vegetation-soil units which generally represent the highest potential source areas for run-off and sediment production in the twelve watersheds. Infiltration rates have been computed and compiled for all vegetation soil units tested during the period of field data collection (summers of 1970 and 1971).

VIII. Plans for Next Fiscal Year: Collected data will be compiled, analyzed, summarized and interpreted during FY 1973. A final report will be completed to meet project objectives, and 100 copies will be furnished to BLM by the contractor.

IX. Reports and Publications to Date: Three annual progress reports (3/3/70, 3/18/71 and 2/23/72) have been completed by the contractor and copies of these have been made available to the Bureau.

BLM RESEARCH PROGRESS REPORT
FY 1972

I. Project Title: Evaluation and Management of Big Game Habitats in Nevada

Contract Number: 14-11-0001-3779(N)

II. Contractor: Nevada Agricultural Experiment Station, University of Nevada.

III. Project Location: Nevada, various districts, generally state-wide

IV. Personnel:

BLM:	1.	Service Center	Frank Stanton
	2.	State Office	Jim Yoakum
Contractor:	1.	Project Leader	Paul Tueller

V. Starting Date: Initiated FY 65
Expected Completion Date: FY 1974

VI. Objective:

1. To evaluate the potential forage production and condition and trend at selected big game habitats throughout the state.

2. To determine the degree of dual use and competition with livestock on these key areas.

3. To determine the characteristics of deer feeds - palatability, nutrition, species preference, etc.

4. To investigate the feasibility of alternative procedures useful for improving big game habitat in Nevada.

5. Additionally, consideration will be given to methodology studies, including those related to animal condition and range utilization.

VI. Progress: Accomplishment this year was to continue investigation of deer and antelope utilization of certain improvement projects, and to include antelope range utilization in relation to its distance from water. Four pinyon-juniper chained sites were observed. On one open site deer use was five times that of the adjacent unchained area. There was a high negative correlation

of deer use with seeded grasses, as crested wheatgrass. On the S. Kern site, for each one percent increase in cover of crested wheatgrass there was an average decrease of 3.87 deer-days use per acre. On Spruce Mountain deer use was positively correlated with sagebrush cover. All P-J chainings showed an initial increase of deer use. Use appears to peak in 3 to 5 years after chaining. Spruce Mountain, after 7 years, has declined to one-half its peak level. Blythe Springs, after 13 years, showed no remaining difference. On the one sagebrush chaining observed (N. Kern) deer use was negatively associated with all seeded grasses other than *Bromus inermus*. A high percentage of native vegetation remained and there was high deer utilization but no initial increase was noted. On chained areas deer use was strongly related to the presence of *Sitanion hystrix*. Of 44 antelope observed, only two were on seedings. Almost all antelope were in the immediate vicinity of available water.

VIII. Plans for Next Fiscal Year: Conduct a follow-up field study to repeat the original site analysis made in 1965-66. Prepare draft report on results of first 8 years of study.

IX. Reports and Publications to Date: Six Masters theses, and annual progress reports.

BLM RESEARCH PROGRESS REPORT
FY 1972

I. Project Title: Modeling the Forestry System of the Bureau of Land Management as a Basis for Predictions and Decisions

Contract Number: 53500-CT3-4(N)

II. Contractor: Research Foundation of State University of New York

III. Project Location: Syracuse, New York and Western Oregon

IV. Personnel:

BLM:	1.	Service Center	Karl Bergsvik
	2.	State Office	Ron Kaufman
Contractor:	1.	Project Leader	Dr. W. A. Duerr

V. Starting Date: FY 1965
Expected Completion Date: FY 1975

VI. Objective:

1. To perform basic research leading to the development of models of the Bureau's land management system.

2. To test the applicability of the models and to devise means for improving such applicability.

VII. Progress:

1. The completion of a study concerning road locations and characteristics which included the development of a computerized program for calculating the construction, maintenance, and user costs of roads along alternative routes.

2. The completion of the development of the Eugene Decision Evaluator model which describes and predicts interactions between resource activities.

3. Began the development of the Eugene Program Simulator which will represent the latest generation model for use in allowable cut planning.

4. Began the development of the Eugene Operations Simulator which will store and retrieve resource related data on a detailed geographic basis.

5. Began the gathering of biological response data relative to silvicultural practices and concurrently the development of a computerized model for their application in timber management planning.

VIII. Plans for Next Fiscal Year:

1. Eugene Decision Evaluator case study to be completed and a report written explaining the model and describing its further applications.

2. Eugene Program Simulator to be programmed for the computer, ready for use with data from the District.

3. Eugene Operations Simulator to be explored and fully planned, with details of its interactions with the Program Simulator.

4. The biological response data to be quantified and the model to be programmed.

5. The Whittaker Timber-Wildlife Simulator to be completed and reported on.

IX. Reports and Publications to Date:

1. Bell, Enoch Frye. Simulating a Silvicultural System. Syracuse, New York. June 1971. viii, 161 pages.

2. Buongiorno, Joseph. Evaluation of Alternative Forest Regulation Methods, a Linear Programming Approach. Syracuse, New York. June 1969. x, 76 pages and appendices.

3. Christiansen, Neils B. Forest Resource Management as a System. Journal of Forestry. October 1968. Pages 778-781.

4. Christiansen, Neils B. Systems Analysis in Land Management. Society of American Foresters, Appalachian Section, Proceedings of the Annual Meeting. Roanoke, Virginia. February 1969.

5. Cunningham, James P. Road Simulation, a Subsystem for Land Management Decision Making. Syracuse, New York. June 1970. iv, 76 pages.

6. Duerr, W. A. "Guides to Land Management", an Integrated Operations-Research Project with a Systems Viewpoint; in Forestry Commission Bull. 44; "Operational Research and the Managerial Economics of Forestry", edited by P. A. Wardle. London. 1971. pages 72-78.

7. Dwyer, John F., and William A. Duerr. Research Needs and Priorities for BLM Forestry in Western Oregon. Portland, Oregon. December 1970. ii, 59 pages.

8. Haver, Gerald F. Economic Guides to Road Location Alternatives on BLM Lands in Western Oregon. Syracuse, New York. June 1971. vi, 92 pages.

9. Nelson, David H. A Guide to Studies of the BLM's Role in the Western Oregon Economy. Syracuse, New York. June 1969. x, 118 pages and appendices.

10. Radosta, John M. Contributions of BLM Resource Management to the Economy of Western Oregon. Syracuse, New York. May 1966. vi, 113 pages.

BLM RESEARCH PROGRESS REPORT
FY 1972

I. Project Title: Cooperative Studies of Timber Quality and Yield

Contract Number: 14-11-0001-3551

II. Contractor: U. S. Forest Service, Pacific Northwest Forest and Range Experiment Station

III. Project Location: Western States

IV. Personnel:

BLM:	1. Service Center	George Hartman
	2. State Offices	John Birch, OSO; Gene Drown, CSO
Contractor:	1. Project Leader	Paul Lane

V. Starting Date: approx. 1960
Expected Completion Date: Continuing Project

VI. Objective: To supply base for timber appraisals.

VII. Progress: Data from numerous recovery studies have been made available the past decade. During the past year, two lumber recovery studies were completed in Oregon, largely at BLM's request. New log grades for Coastal Douglas-fir were developed and promulgated. Further work was also done toward completion of grading systems for western white pine and western larch.

VIII. Plans for Next Fiscal Year: A hemlock lumber and plywood recovery study in western Oregon; completion of a study for lumber and plywood recovery from small Douglas-fir timber in western Oregon; preparation of plans for a true fir recovery study in western Oregon and one in western Washington; supply of data from previous Douglas-fir studies in a specialized card format; revision of recovery ratio on Douglas-fir studies to put in line with appraisal practices.

IX. Reports and Publications to Date: Several in-house reports were furnished during the past year.

BLM RESEARCH PROGRESS REPORT
FY 1972

I. Project Title: Development and Propogation of Blister Rust Resistant Strains of Western White Pine and Sugar Pine

Contract Number: 14-11-0001-4361(N)

II. Contractor: U.S. Forest Service

III. Project Location: Western Oregon - Dorena Forest Research Tract

IV. Personnel:

	BLM:	1. Service Center	Karl Bergsvik
		2. State Office	Charles Thomas
	Contractor:	1. Project Leader	Peter Thiessen

V. Starting Date: FY 1959
Expected Completion Date: Indefinite

VI. Objective: To develop rust resistant strains of western white pine and sugar pine for growing timber crops.

VII. Progress:

1. Tree location and breeding:

   a. Crosses completed: sugar pine-165, w.w. pine-133
   b. Crosses started: sugar pine-41, w.w. pine-106
   c. Diallel crossing plans started: sugar pine-4, w.w. pine-7
   d. Fl orchard crosses: w.w. pine-121
   e. New parents by Dorena: sugar pine-96, w.w. pine-69
   f. New parents by forest: sugar pine-227, w.w. pine-172

2. Seed extraction and sowing:

   a. Seed lots extracted:
   F.S. w.w. pine-395, sugar pine-35
   BLM w.w. pine-24, sugar pine-137

   b. Seed lots sown for evaluation of resistance:
   F.S. w.w. pine-234, sugar pine-147
   BLM w.w. pine-26, sugar pine-100
   (completed 2 diallel crosses also sown)

c. Seedling lots planted for evaluation of resistance:
F.S. w.w. pine-229, sugar pine-145
BLM w.w. pine-14, sugar pine-63

d. Seedling lots innoculated for resistance evaluation:
F.S. w.w. pine-130, sugar pine-41
BLM w.w. pine-2, sugar pine-36

3. Progeny lots evaluated for resistance:
sugar pine-42 lots (of which 13 F.S. and 15 BLM were identified as new genotypes)

4. Seed orchard management:

a. Number of sibs planted in orchard:
F.S. w.w. pine-1,987
BLM w.w. pine-20
(290 sugar pine trees sent to Sprague nursery)

b. Number of grafts maintained in orchard:
F.S.-5,154
BLM-1,088

c. Number of cones in orchard for reforestation seed:
w.w. pine-3,900

d. Number of flowers pollinated in orchard for reforestation seed:
w.w. pine-15,000+

e. Seed production for reforestation for w.w. pine:
3.2 lbs.

5. Number of ribes planted in ribe garden: 72

VIII. Plans for Next Fiscal Year:

1. Continue to produce seed with usable resistance so that reforestation seed needs can be satisfied beginning in 1974.

2. Continue to upgrade resistance and other desirable traits of western white pine and sugar pine.

IX. Reports and Publications to Date: None.

BLM RESEARCH PROGRESS REPORT
FY 1972

I. Project Title: Effect of Chemical Fire Retardants on Survival of Juvenile Salmonids

Contract Number: 53500-CT2-85(N)

II. Contractor: National Marine Fisheries Service, Northwest Fisheries Center, Seattle, Washington

III. Project Location: Prescott Environmental Station, Prescott, Oregon

IV. Personnel:

BLM:	1.	Service Center	Robert Borovicka
	2.	State Office	None
Contractor:	1.	Region	George Snyder
	2.	Laboratory	Ted Blahm

V. Starting Date: September 1, 1971
Expected Completion Date: June 30, 1973

VI. Objective:

1. Conduct a series of bioassay tests to determine the affect of four commercial fire retardants on two size classes of juvenile coho salmon and juvenile rainbow trout.

2. To determine the median tolerance limit (TL_M), i.e., the concentration of the tested retardants at which 50 percent of the test animals are able to survive for a specified time.

3. Provide results of the work to the Bureau of Land Management and publish the information for proper distribution to interested agencies and personnel.

VII. Progress: Test apparatus (including chemical diluters) was fabricated and installed during September and November. The diluters are required to fractionate concentrations of the retardants to predetermined test levels for flow-through bioassay.

Concurrent with the above mentioned activity, and extending into early December, eight static bioassay tests (96 hr. TL) were completed. These tests helped establish a general toxic range for the retardants. Juvenile coho and rainbow trout were used for these tests. The data collected from the static tests

provided the basis from which the flow-through test concentrations were determined. Following is a summation of the results of the static tests.

STATIC TESTS

FIRETROL

		931				100	
		Concentration PPM				Concentration PPM	
		Coho	Rainbow			Coho	Rainbow
Mortality	1st	200	12.5	Mortality	1st	400	12.5
	50%	300	100.0		50%	500	50.0
	100%	500	600.0(90%400)		100%	500	200.0

PHOSCHEK

		259				202	
		Concentration PPM				Concentration PPM	
		Coho	Rainbow			Coho	Rainbow
Mortality	1st	100	112.5	Mortality	1st	125	112.5
	50%	125	112.5		50%	150	150
	100%	200	150		100%	200	200

Following are the preliminary results of sixteen continuous-flow bioassay tests using two species of juvenile salmonids (two sizes of each) to test the toxicity of four commercial fire retardants. The tests were completed December through June 1972. An extrapolated tolerance limit, to the lowest concentration causing 50 percent mortality, (192 hr. TL_M) is given below in parts per million (ppm).

	Firetrol 931	Firetrol 100	Phoschek 259	Phoschek 202	
				NMFS	Montsanto
Rainbow trout					
50-90 mm	415	500	145	120	46.5 1/
100-120 mm	350	525	132	135	
Coho salmon					
50-90 mm	700	900	155	140	
100-140 mm	450	380	142	150	
		(600)	(300)	(300)2/	

1/ Tests done by Montsanto Chemical Co.

2/ Levels in ppm causing 100 percent mortality from tests done at Corvallis by EPA.

These values do not compare perfectly with the results of the static tests; the flow-through tests probably reflect the most realistic values for lethal concentrations.

A final report will be prepared for editing and review by participating agencies. The preliminary report will be completed as scheduled in the original contract.

VIII. Plans for Next Fiscal Year: 1973 research will be directed toward assessing the effect of water temperature and pH on the toxicity of the fire retardants.

IX. Reports and Publications to Date: None. Results of bioassay to date should be confidential. No conclusions as to toxicity to fish between chemical retardants should be made until all work is completed and exposed to statistical analysis. Conclusions should be approved by both National Marine Fisheries Service and Bureau of Land Management.

BLM RESEARCH PROGRESS REPORT
FY 1972

I. Project Title: The Response of Animals to Herbicide Induced Vegetational Changes

Contract Number: 14-11-0001-4249(N)

II. Contractor: Oregon State University

III. Project Location: Western Oregon (Salem, Eugene and Medford Districts)

IV. Personnel:

BLM:	1.	Service Center	William Smith
	2.	State Office	Charles Thomas
Contractor:	1.	Project Leader	Dr. Hugh Black

V. Starting Date: FY 70
Expected Completion Date: FY 1974

VI. Objective: To determine the feasibility of protecting forest regeneration from certain species of animals by controlling non-coniferous vegetation with herbicides.

VII. Progress: The University has completed studies in the Salem and Eugene Districts that assess the impact of treatments on usage of regenerated areas by deer and various species of small mammals. Work in the Medford District is on schedule as described in the University research outline dated March 31, 1972.

VIII. Plans for Next Fiscal Year: Retreatments of previously treated areas may be necessary. Data will continue to be collected and analyzed.

IX. Reports and Publications to Date: Project leader and assistants presented a paper at the meeting of the Western Association of Game and Fish Commissioners at the Sheraton on July 19, 1972. Thesis will be complete soon.

BLM RESEARCH PROGRESS REPORT
FY 1972

I. Project Title: Inter and Intra Specific Hybridization in the Genus Pseudotsuga

Contract Number: 14-11-0001-4250(N)

II. Contractor: Oregon State University

III. Project Location: Western Oregon

IV. Personnel:

BLM:	1.	Service Center	Karl Bergsvik
	2.	State Office	Charles Thomas
Contractor:	1.	Project Leader	Dr. K. K. Ching

V. Starting Date: July 1, 1966
Expected Completion Date: Indefinite

VI. Objective: To determine the best mating combinations for more rapid height growth and improved survival in provenance and species hybrids of Douglas-fir.

VII. Progress:

1. In the spring of 1971, a total of 201 crossings had been made, involved 59 seed parents and 20 pollen parents from selected trees in the Douglas-fir provenance plantations. Seeds harvested in the fall were to be sown in the spring of 1972.

2. Two female-conebuds had been detected on one of the Chinese Douglas-fir (*Pseudotsuga sinensis*) in the Genetics Research Nursery area. Development of these precious conebuds will be closely watched for in the spring of 1972.

3. Height growth and survival of provenance hybrid seedlings from 1966 crop year were assessed from four testing areas.

4. Two papers, supported by the BLM fund, on cytology of Douglas-fir were published by Forest Science and Silvae Genetica. One paper is first of its kind and deals with karyotypes of all known species in the Genus of Pseudotsuga while the second paper reports on a rare specimen, a Chimera (a plant that is not genetically uniform throughout) Douglas-fir.

VIII. Plans for Next Fiscal Year:

1. Since we have four progeny testing areas (Dorena, Burnt Woods, McDonald Forest and the Genetics Research area in Corvallis), and over 12,000 of hybrid and control seedlings outplanted in the field since 1969, the field assessment in 1973 will be made only with the group of trees, approximately 7000, that was planted in 1969 and 1970.

2. Selection of superior growing stock with a specific crossing combination to determine the following characteristics: rate of growth, survival, drought resistance, tree form and other desirable traits.

3. Set up of a computer program to accommodate all field measurements for short- and long-term analysis.

4. Continue nursery operation on hybrid seedlings from seeds sown in the spring of 1972. By the end of the growing season of 1973, these 2-0 seedlings will be outplanted in two progeny testing sites on BLM lands.

IX. Reports and Publications to Date:

1. Ching, Kim, and Allen Doerksen. A Natural Chimera of Douglas-fir. April 1970. OSU paper.

2. Ching, Kim, and Dale Bever. Provenance Study of Douglas-fir in the Pacific Northwest Region. Silvae Genetica. Jan-Feb 1969.

3. Ching, Kim. Hybridication Between Douglas-fir and Bigcone Douglas-fir. Forest Science. Vol. 5, No. 3. September 1959.

4. Thomas, Gerald, and Kim Ching. A Comparative Karyotype Analysis of Pseudotsuga menziesii (Mirb.) Franco, and Pseudotsuga Wilsoniana (Hayata). Silvae Genetica. Vol. 17, No. 4. 1968.

BLM RESEARCH PROGRESS REPORT
BY 1972

I. Project Title: Forest Fertilization in the Douglas-fir Region of the Pacific Northwest (Phases I and II)

Contract Number: 14-11-0001-4637

II. Contractor: University of Washington

III. Project Location: Douglas-fir region

IV. Personnel:

BLM:	1. Service Center	George Hartman
	2. State Office	Byron Thomas
Contractor:	1. Project Leader	Dr. David Thomas

V. Starting Date: July 1, 1970
Expected Completion Date: Continuing Project

VI. Objective: To estimate results of forest fertilization under various circumstances.

VII. Progress: In Fiscal Year 1972 half of the soil samples were taken, the first half of Phase II (thinning) plots were installed, and the remaining half of the Phase I plots were installed. In addition, a study on the mineralization of nitrogen was completed and work was continued on the pathogenics and the mensuration studies. All of the study data were transferred to computer cards.

VIII. Plans for Next Fiscal Year:

Field Work:

1. Locate, survey boundaries and mark for thinning 27 additional Phase II installations.
2. Make soil collections and descriptions for 57 Phase I installations.
3. Make foliage collections.
4. Supervise thinning.
5. Tag trees, measure and fertilize the 27 Phase II installations.

6. Make two-year remeasurements on all second year Phase I installations.

7. Make wood quality collections.

Office Work:

1. Complete computer summaries for two-year data on first year Phase I installations. Distribute to cooperators.

2. Process data, keypunch, verify and computer runs on first year Phase II installations.

3. Provide faculty supervision for graduate student research projects.

4. Run soil and foliar analyses.

5. Run wood quality tests.

IX. Reports and Publications to Date: None

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